

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Define the concept of activity. Explain the determination of activity and activity coefficient using EMF and freezing point methods.
17. Discuss the distribution of distinguishable and indistinguishable particles, including the derivation of their probability distributions.
18. Describe the Einstein and Debye models for the heat capacity of solids, including their assumptions, derivations, and limitations.
19. Provide a comprehensive overview of the theories of conservation of mass and energy.
20. (a) Explain the kinetics of $H_2 - Br_2$ photochemical reaction. (5)
(b) Describe the kinetics of cationic and anionic polymerization (5)

APRIL/MAY 2025

23PCH22 — PHYSICAL CHEMISTRY – I

Time : Three hours

Maximum : 75 marks



SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. What is the significance of partial molar properties in mixtures?
2. Give the Duhem – Margulus equation for ideal mixtures.
3. Write a brief note on translational partition functions for ideal gases.
4. What do you understand from statistical thermodynamics?
5. What is the significance of partition functions in calculating thermodynamic functions?
6. What distinguishes the heat capacity of monoatomic and diatomic gases?

7. State the concept of Onsager reciprocal relationships.
8. Give examples of electrokinetic and thermomechanical effects.
9. Define chain length.
10. Briefly explain the steps of free radical polymerization.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) How to determine the fugacity using the graphical method?

Or

- (b) Explain the variation of chemical potential with temperature and pressure.

12. (a) Elaborate the concepts of thermodynamic and mathematical probabilities.

Or

- (b) Compare and contrast between Maxwell-Boltzmann and Fermi-Dirac distribution statistics.

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13. (a) Discuss the role of partition functions in calculating equilibrium constants and how they relate to thermodynamic functions.

Or

- (b) Explore the concept of residual entropy and its significance in statistical thermodynamics.

14. (a) Explain how entropy production serves as a measure of irreversibility in thermodynamic processes.

Or

- (b) How can irreversible thermodynamics be applied to biological systems?

15. (a) Describe the evaluation of thermodynamic parameters of activation.

Or

- (b) Explain the role of primary salt effect and secondary salt effect in reaction rates in solutions.

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